Utility Operating Environment and Business Models in the Energy Cloud

Prepared in Response to a Call for Papers for: Smart Electric Power Alliance (SEPA)

1. TIPPING POINTS

We are in an era of redefining the core utility business model that is based on the generation and delivery of power to consumers and, as a result, the regulatory model. Resolute state and federal energy policy and increasing consumer interest in distributed energy resources (DER) have helped spur rapid advances in technology. These advances, in turn, have improved the delivered price of DER and are dramatically reshaping the industry. We are seeing a significant transformation in how customers are powering their homes and businesses and in their ability to not only generate their own electricity, but also store it. More recently, the lingering promise of a realistic and affordable EV has begun to become a reality.

Figure 1. Energy Sector Tipping Points

- Ceres Power Forward 3.0: 240 Fortune 500 companies (48%) reported carbon reduction targets to the CDP in 2016. Also, 56 Fortune 500 companies reported savings of $2.5 billion in 2016 due to emissions-reducing projects.
- RE100 has over 100 large, influential businesses (incl. Global Fortune 500), with a total revenue of US$2.5 trillion, transitioning to 100% renewables across their global operations.
- Shell Plans to Spend $1 Billion a year on Clean Energy by 2020.
- Investment in electricity (716B) surpassed investment in oil and gas (708B) in 2016, for the first time in recorded history - IEA’s World Energy Investment report.
- US monthly renewables generation surpasses nuclear for first time in 33 years (March). In 2016, natural gas, solar, and wind represented 90% of U.S. generation additions.
- Distributed Energy Resources (DER) are growing 3 times faster than central station generation between 2015-2019 in the US (168 vs 57 GW).
- Electric vehicles have another record year, reaching 2 million cars in 2016. Volvo is first automaker to offer Electric or Hybrid only by 2019. By 2020 Tesla will be able to produce 500,000 cars per year, with range > 215 miles at 59k (20,000 will be produced in Dec-17).

Source: Navigant
1.1 A Changing Ecosystem: The Energy Cloud

Figure 2. Grid Ecosystem of the Energy Cloud

Source: Navigant

As the role of DER becomes clear and as more activist consumers participate at more points in the energy value chain, Navigant sees the topography of the grid transitioning to the Energy Cloud. We define the Energy Cloud as a dynamic distributed energy system filled with diverse solutions, technologies, and market actors. It has profound implications for the physical operations of the grid and the central business model of utilities. For example, emerging complexity at the distribution level for grid operations and system planning will need to be managed as we transition from the central station model to two-way and dynamic power flow. In some manner, Navigant expects there to be an added domain tied to market operations to price and settle DER at the customer level.1

1.2 A Modern Update to the Regulated Franchise: The Enabling Platform

In response to the dynamic grid and business environment, utility operations are transitioning from the traditional volumetric sale and delivery of electrons to the interconnection and optimization of DER assets and networks—and the many business models that will evolve. The utility will increasingly play a role in maximizing the benefits to both direct customers and third-party market actors as an owner/operator of an enabling platform.

This new industry paradigm alters the traditional utility model along physical and financial lines. The physical aspect requires greatly enhanced grid planning and operations to operate a two-way power flow grid. New financial metrics are needed to accommodate a shift from the historical notion of the volumetric sale of electricity and delivery to end-use customers to incentivize the interconnection and optimization of DER. In Figure 3, Accountabilities of the Enabling Platform, Navigant provides a visual representation of the diverse lines of accountability for the utility platform that is at the center of the distribution ecosystem to accomplish the following:

- Meet the needs of direct customers (i.e., safe, reliable, and affordable service plus access to individualized products and services)
- Foster the interconnection and business models of third parties
- Meet the expectations of regulators and advance state policy goals
- Enable flexibility (through dynamic, intelligent, and connected infrastructure)
- Interact and balance with the bulk system, often via an independent system operator (ISO)

Figure 3. Accountabilities of the Enabling Platform

Source: Navigant

The distributed system platform provider (DSPP) as defined in New York’s Reforming the Energy Vision (REV) is an excellent example of the utility as an enabling platform and the redefinition of regulated utility franchise.2 In the REV process, regulators have articulated distribution planning, grid operations, and market operations as the three principal domains of the regulated utility as a platform.

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1. A hallmark of the New York’s Reforming the Energy Vision (REV) is the notion of “animating the market,” which is an expression of a robust level of DER options at the distribution level spurred by data on customer wants, system needs, and a pricing mechanism.

2. REV stakeholders developed a working definition of the DSPP that was formally adopted to state, “The DSPP operates an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers’ and society’s evolving needs. The DSPP fosters broad market activity by enabling active customer and third-party engagement that is aligned with the wholesale market and bulk power system.” See “Joint Utilities Track 1 Filing” dated 7/24/17, http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=15-T-0180&submit=Search+by+Case+Number.
For utility operators, step change is occurring in terms of operating complexity so they can see DER on their systems and optimize their operations in ways that are critical to maintaining a balanced, reliable system. To achieve this level of operating sophistication, the grid itself and the supporting systems will need to be dramatically more intelligent and adaptive.

**Figure 4. DSPP Domains, Evolution of the Platform**

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<thead>
<tr>
<th>DSP Provider Functions</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
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<td>1. Distribution Planning</td>
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<td>A. Broader and more systematic use of probabilistic distribution engineering analysis</td>
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<td>B. DER Interconnection studies and procedures</td>
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<td>C. DER hosting capacity analysis</td>
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<td>D. Benefit-cost locational value analysis</td>
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<td>E. Integrated Resource, Transmission &amp; Distribution planning</td>
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<td>2. Grid Operations</td>
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<td>A. Design-build and ownership of distribution grid</td>
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<td>B. Switching, outage restoration, and distribution maintenance (including DER for safety and reliability)</td>
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<td>C. Physical coordination of DER schedules with NYISO</td>
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<td>D. Manage local distribution balancing</td>
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<td>3. Market Operations</td>
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<td>A. Aggregation of utility demand response, measurement and verification (‘M&amp;V’), and settlement</td>
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<td>B. Sourcing advanced distribution grid services from DER, M&amp;V, and settlement</td>
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<td>C. Optimal dispatch DER-provided distribution grid services</td>
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<td>D. Aggregation of non-utility DER for wholesale market participation</td>
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<td>E. Enable distribution-level energy markets &amp; real-time constraint management</td>
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<td>F. Clearing and settlement for third-party distribution energy transactions</td>
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<td>G. Market facilitation services for market participants</td>
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Source: Navigant

In Figure 4, Navigant shows the three domains of the DSPP as a reference case for the regulated utility platform and a staged progression over time as investments are made in enabling technologies. Increasing sophistication in platform operations will involve adding critical devices and systems in concert with dramatic shifts in the day-to-day functions and skill requirements of utility employees. A decade ago, this concept was referred to as the smart grid. Today, this level of functionality is an operational must. In our view, the functionality and technology of the platform is becoming the new normal of utility operations in an Energy Cloud world.

**2. EVOLVING BUSINESS MODEL AND NEW REGULATORY MODEL**

Due to the structural shift toward a DER-centric financial model for the utility as a platform, there needs to be demonstrably new thinking in terms of the utility franchise, its business model, and the resulting regulatory framework. It is vitally important that these topical domains be considered together because of their natural interdependencies. We are experiencing structural disruptions to the basic tenets of what has been rate regulation and oversight of electric utilities. The utility is no longer going to be the sole provider of electric services. In an Energy Cloud grid environment, utilities will be called upon to balance and optimize a system that will be increasingly dynamic and complex. They must do so from both a physical and market perspective. In Figure 5, Navigant provides a forecast of a shift in investment patterns in the Energy Cloud away from central station toward the grid edge.⁴

**Figure 5. Changing Value Proposition in the Energy Cloud**

Overall, at least $1.3 trillion in new revenue opportunities will be created in the Energy Cloud by 2030, according to Navigant estimates. Most of these transactions will flow through multiple customer-centric growth platforms such as Integrated DER (iDER), Buildings2Grid (B2G), Transportation2Grid (T2G), Internet of Energy (IoE), Transactive Energy (TE), Neural Grid, and Smart Cities.

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2.1 What Is Core Service?

To restructure the regulatory model, we must first examine what makes up the basic services that we want all customers to have access to, and for which we see a natural monopoly or essential service business model. This set of core services will be primarily where oversight and rate regulation continues to be required to check monopoly power, protect consumer interests, and advance public policy goals.

In our view, we see the distribution grid itself—poles, wires, and substations and the people and intelligent systems that support it—as the core utility function that is the foundational layer of the modern utility franchise. Albeit at a much higher level of complexity as a platform operator with much enhanced system planning, grid automation, and market operations. Figure 4 from the REV process illustrates this point. It will be critical for regulators to develop detailed functional requirements like distribution service implementation plans (DSIPs) in New York or distribution resource plans (DRPs) in California to identify the span of technical functions and operating processes that utility platforms will entail.4 The capitalization of this asset mix must be part of the rate base of the utility franchise going forward.

2.2 Regulation of the Platform

Adaptation in a regulatory sense means revisiting not only the way rates are set to drive core revenue, but also the kind of environment that is conducive to greater innovation in business operations and in offerings and interactions with customers. The utility as a platform will need to be adept and responsive with answers for customers, requiring a much more rapid regulatory approval process for new product offerings. This same dynamic occurred in the telecom industry. Incumbent exchange operators saw the increasing presence of new entrants that could offer new services at any point, while the regulated phone company needed to navigate a time-intensive regulatory process. Over time, alternative regulation was introduced to adjust the regulatory oversight to areas that remained monopoly service while allowing flexibility for the incumbent to offer new solutions to customers under abbreviated processes.

The term ratepayer will increasingly seem archaic, with customers and diverse business models interconnecting to the platform. Our century-old model of a system designed to serve captive ratepayers at the end of the system is shifting toward prosumers who solution their energy needs in diverse ways and may simply want to interconnect to the platform as a backup or to sell to their neighbors via blockchain. Customer segmentation according to residential and commercial and industrial will no longer suffice. From a ratemaking perspective, Navigant does not foresee the continuation of the lengthy, formal regulatory process that is so common today or volumetric least cost rates in the traditional sense. We will need a more flexible regulatory model that accomplishes the following:

- Adapts rate setting to a low product volume revenue model
- Provides a clear financial path to recover the costs of smart grid functionality and continuous enhancement
- Introduces flexibility in its approach to foster innovation and new customer offerings
- Incents the platform as a multi-party, multi-interest enabler
- Aligns policy interests and market animation with grid design and operations

2.2.1 Rate Structure and Rate Design

By design, the enabling platform does not entail the volumetric sale of electrons and often may not involve delivery of electrons. But the fixed costs of infrastructure will still need to be recovered consistently to satisfy capital markets and investor expectations. Therefore, rates charged by the utility platform need to transition to a fixed fee sort of design that charges all customers for access. The rationale is that customers will still require a certain level of capacity to be maintained for them—even if that is standby capability for their onsite DER. Thus, the utility as platform operator would charge a fee indexed according to the amount of capacity maintained. This would look and work in many ways like how broadband is priced based on the size of the pipe provided to the customer.

The emphasis of our examination of ratemaking and regulatory mechanisms in this paper is on how the platform will be paid for the largely regulated services it will provide going forward; we focus on what will drive the revenue and earnings of the regulated franchise. We recognize an entirely separate element will entail how DER is compensated for services it will provide to the platform that is a part of the overall financial flows of the Energy Cloud, but that is not within the span of this paper.

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4. See also Massachusetts Grid Modernization process and development of utility grid modernization plans (GMP). Docket 12-76-B, [http://170.63.40.34/OPU/FileRoomAPI/api/Attachments/Get/AttachmentId=12-76%2fOrder_1276B.pdf](http://170.63.40.34/OPU/FileRoomAPI/api/Attachments/Get/AttachmentId=12-76%2fOrder_1276B.pdf)
2.2.2 PBR 2.0

Navigant anticipates that a performance layer will be added to the core rate setting for the utility franchise. The objective will be to offer financial incentives in return for achieving desired platform outcomes that advance policy and the creation of a DER market environment. Upward incentives via a performance-based ratemaking (PBR) format will put in place the degrees of freedom and financial reward for innovation, especially as the role of platform operator moves away from acting as the traditional revenue engine for the franchise. This same logic led to the earnings adjustment mechanisms (EAMs) that are available to utilities as DSPPs in the REV structure. PBR 2.0 can bring together aspects of traditional alternative regulation married with newer models such as RIIO in the United Kingdom, REV, and the EIMA model in Illinois. PBR 2.0 is much more based on outputs than inputs, and the oversight role is much more of an ongoing performance review via dashboard indicators than protracted docket proceedings. The key attributes of PBR 2.0 include the following:

- Capital spending plans based on projected spending instead of historic test year
- Operating and maintenance costs that are pegged to a formula over duration of the plan
- Capital spending plan that stems from state policy goals, system conditions, and customer demands
- Cost-effectiveness tests to establish customer and system benefits
- Plan is presumed prudent and in force for the plan term once reviewed and approved
- Baseline return on equity established in the plan with incremental adjustment based on performance

2.3 The Hierarchy of the Utility Business Model

In the Energy Cloud, Navigant sees a hierarchy that is built based upon the need for monopoly service as a foundational platform that transitions to an increasingly competitive environment as we move upward in the industry vertical. The level of risk and reward will increase as we move from regulated services toward the competitive market, with the role of regulation diminishing in kind.

The platform role is integral, as it has tremendous operational complexity and is the linchpin for unlimited use cases and business models. Moving vertically from the platform, the services provided to customers are increasingly competitive or contested. In the midrange of the vertical, there will be a mixture of entrants that can include the incumbent, third parties, and often partnerships between the incumbent utility and third parties. Navigant envisions utilities developing a range of value-added services from the platform to integrate and optimize grid edge resources such as T2G, B2G, IoE analytical insight, and smart city applications. The exact circumstances will vary in restructured versus unrestructured market structures and the individual calculus and prevailing policies of the states.

When we approach the fully competitive market environment, we would expect that all participants are unregulated, competitive business models. Like any other competitive market environment, there can be heightened risk that can translate to superior returns, as well as losses. At this end of the spectrum, relative value, and therefore acceptable pricing, will ultimately be decided by customers.

We are increasingly seeing a competitive landscape developing in the Energy Cloud, and so the manner of and role for regulation will be very different. The foundational platform is where much of the traditional regulatory role continues, albeit with the structural reforms we describe as PBR 2.0.

Figure 6. Energy Cloud Market Hierarchy

Source: Navigant

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5. See the REV Connect portal for more on REV Track 2 financial mechanisms, including earnings sharing mechanisms, nyrevconnect.com/rev-briefings/track-two-rev-financial-mechanisms.
6. RIIO, implemented by UK regulator Ofgem, stands for Revenue = Incentives + Innovation + Outputs; EIMA refers to the Energy Infrastructure Modernization Act implemented in Illinois in 2012. RIIO, EIMA, and REV each entail long-term grid business plans by the utility franchisee.
7. Increasingly across the global industry, utilities and third parties are forming partnerships that leverage their respective strengths to bring new offerings to customers. Navigant has been engaged for the past year in REV Connect, a matchmaking function designed to accelerate and deepen utility and third-party partnerships, www.nyrevconnect.com.
2.3.1 51st State Pathways

Navigant does not advise drawing bright line barriers in terms of what players should offer what services in the Energy Cloud. We offer the hierarchy in Figure 6 as a set of variables and a spectrum to think through roles, business models, and regulatory systems. To further the discussion, we also offer some potential future scenarios that can evolve in coming years.

2.3.1.1 Pure Platform Model

In this scenario, the utility franchise is constructed around the role of the platform, with poles, wires, and substations as assets owned and operated by the utility. Cost would be recovered through regulated rates that are designed around an interconnection model where customers all contribute to the cost of grid. Platform-oriented services such as data provision, DER integration, and EV charging infrastructure can be part of base rates or compensated via individual fee schedules approved by regulators. (See the Energy Cloud Platforms sidebar.)

Incremental products and services at the premise level or behind the meter would be considered competitive with utility entry via unregulated businesses. Pricing for services outside the regulated franchise are competitively established. Restructured jurisdictions are likely candidates for the pure platform model, as utilities in these states are typically precluded from owning DER.

2.3.1.2 Mixed Platform Model: The Network Orchestrator

In this scenario, the regulated utility offers competitive services under a set of established market protocols and oversight by the state commission. Pricing for services offered by utilities could be competitively set (i.e., what the market will bear). Market actors would compete on a similar basis. The presumption is that regulatory market oversight of standards and protocols is sufficient to check concerns regarding uncompetitive practices. The larger benefit of this scenario is that the greater margin the utility can earn, the stronger the financial position of the regulated franchise. Regulators can establish earnings sharing mechanisms to establish how much reverts to ratepayers versus what is retained by shareholders.

ENERGY CLOUD PLATFORMS

Navigant envisions a range of value-added platform services that utilities can offer that optimize DER business models and maximize value for customers and third parties alike:

- DER: Coordinated, aggregated DER and programs combined with networking and communications technology across a service territory.
- B2G: Nexus between connected building infrastructure and the grid. Includes integrated controls and automation over internal systems.
- T2G: Nexus between electrification of transportation and the grid.
- IoE: IoE leverages sensors, telecom infrastructure, and machine learning to provide a digital foundation for the industry.
- TE: A power/energy system where market-based platforms are used to make decisions involving the generation, distribution, and consumption of energy.
- Neural Grid: An autonomous grid leveraging artificial intelligence, connectivity, and sensing technologies.
- Smart Cities: The integration of technology into a strategic approach to sustainability, citizen well-being, and economic development in urban centers.

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8. In Track 1 of the REV process, the question of whether the utilities should be designated as distributed system platforms (DSPs), the issue of anti-competitive behavior was raised. The Joint Utilities aptly pointed out that strong protocols and oversight of DER integration with the DSP would be sufficient protection. Further, given the great number of interconnections and operator actions that take place daily on the distribution grid, the public good would be best advanced by the owner/operators of the grid to be designated as the DSP. See “Joint Utilities Track I Filing” dated 7/21/17, http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?CaseNumber=15-M-0380&Submit=Search+by+Case+Number.

3. CLOSING THOUGHTS

Sorting through this transition of a long-standing, regulated industry through the digital age is difficult. The issues are many and complex. The questions of what aspects of the business should the incumbent utility participate in versus what should be a pure market environment rage on. Navigant does not profess to have all the answers; rather, we aim to help advance the discussion in meaningful ways.

The notion of the Energy Cloud as a hierarchal market that spans from a foundational monopoly layer to increasingly competitive spaces is offered in this paper as an illustration and thought exercise. We do not take a position here that there are absolutes in terms of what part of the vertical should be reserved for utilities or third parties. While keeping the incumbent out of competitive services may assure that monopoly power is not exercised, it forecloses plenty of cases where incumbent utilities can provide tremendous value. Conversely, there are many cases where new entrants can bring new thinking and technology to provide value to customers. While we do not establish bright lines of separation within the industry vertical, we do believe there are some critical design considerations to frame out the 51st State:

- We must recognize the fundamental shifts in the topography of the utility business in an Energy Cloud world; we are in the era of the enabling platform.

- Regulators and third parties must understand and embrace the enhanced grid intelligence and operating sophistication of the utility as a platform. State energy policies and new business models cannot advance without investment in a modernized grid.

- Long-standing regulatory practices are not aligned with the utility as a platform. Critical to the 51st State is a substantial redesign of regulatory systems. A platform needs to be regulated in a way that offers tremendous flexibility, rewards innovation, and addresses the permanent shift from volume of sale. And as the energy value chain is increasingly contested, the depth and breadth of the regulatory role must be recalibrated.

- Either/or distinctions in terms of who can play in what part of the vertical are ill-advised. Look for the path to the greatest value for customers and society in lieu of philosophical stands. There are persistent examples in the global industry today of effective utility/third-party partnerships that harness their respective strengths. The 51st State will be marked by partnerships that marry utilities access to capital and grid expertise, with new technology and thinking from diverse sources.

About Navigant

Navigant Consulting, Inc. (NYSE: NCI) is a specialized, global professional services firm that helps clients take control of their future. Navigant’s professionals apply deep industry knowledge, substantive technical expertise, and an enterprising approach to help clients build, manage, and/or protect their business interests. With a focus on markets and clients facing transformational change and significant regulatory or legal pressures, the firm primarily serves clients in the healthcare, energy, and financial services industries. Across a range of advisory, consulting, outsourcing, and technology/analytics services, Navigant’s practitioners bring sharp insight that pinpoints opportunities and delivers powerful results. More information about Navigant can be found at navigant.com.